Testimony for Senate Science and Space Committee. "Sharks!" hearing 7/18/2018
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Good morning. It is in the national interest for us to have healthy and abundant oceans to provide us with ecosystem services like food, transport, mineral resources and recreation. Globally, ocean assets have been valued at 24 trillion dollars, delivering more than half a trillion dollars' worth of benefit to humankind annually. To have abundant oceans, we need healthy shark populations to play their important role as regulators of the marine food web. This need is under threat because 25% of shark species are at risk of extinction, largely due to the extraction of over 100 million sharks by fisheries every year. Improved shark conservation is increasingly expected by the public as sharks have transitioned from being widely vilified to their current status as an iconic and widely admired and respected group. You only need to look at the success of Discovery's Shark Week to see what I mean, or perhaps this very hearing.

Public aquariums play an important role in increasing public understanding and appreciation of sharks. The 55 AZA Accredited aquariums across the country inspire million guests per year through live animal exhibitry, allowing them to create personal connections to these extraordinary and ancient animals and motivating them to protect sharks for future generations. Many aquariums have their own in-house research programs that work with partners in academia and the NGO sector to advance the science and conservation of sharks. At Georgia Aquarium, which is a 501c3 non-profit aquarium in Atlanta, we have a long track record studying the ecology of whale sharks and manta rays, and we're expanding to study and conserve more quintessentially "toothy" sharks as we prepare for a major expansion project focusing on sharks, which is set to open in 2020.

Successful research on sharks is no mean feat because many sharks are highly migratory, traversing huge expanses of ocean and crossing through many different jurisdictions and borders in the process. Advances in technology have improved our ability to understand what sharks are doing when they go beyond our ability to follow in person. In particular, different types of electronic tag devices allow us to answer increasingly sophisticated questions about shark biology. Many of these tags incorporate sensors like you might find in a smart phone, and they connect the sharks to the scientist through satellite link-ups whenever that iconic dorsal fin breaks the surface. These studies have shown, for example, that a single whale shark can cross the entire Pacific ocean from the Gulf of California to the Mariana Island; these animals truly are global citizens.

There are some significant challenges that face scientists trying to understand the biology of sharks. One simple but particularly vexing problem is that we have very limited options regarding the satellite systems that scientists can access. Almost all satellite tagging with sharks uses the French-based CLS-ARGOS satellite system developed in collaboration with NASA and NOAA in the late 1970's. This legacy system forms a de facto monopoly that is ripe for disruption by open source initiatives. One such initiative called the Next Generation Animal Telemetry Project is currently being considered by the Bureau of Ocean Energy Management and NASA and would utilize the revolution in small open platform satellites, often called "cube sats", to massively expand the coverage and available bandwidth.

Congress can help shark research and conservation greatly in three ways. First, by encouraging and supporting strategic regulatory changes and funding initiatives that open up

the satellite sector, encouraging open-source initiatives in particular, and increasing scientists' access to a wider array of satellite assets. I encourage the committee to support exactly the kinds of initiatives represented by the BOEM/NASA cube sat approach. Second, Congress should institute and fund programs to support accredited aquariums in their efforts to promote shark research and conservation. As non-traditional research facilities, it can be difficult for AZA facilities to tap into NSF and other federal funding sources; right now the Institute for Museum and Library Services is perhaps the only federal agency offering explicit support to zoos and aquariums. Third, Congress should encourage and support multilateral management initiatives that aim to protect sharks across international borders. For example, there is presently no regional plan with Mexico, Cuba, Belize and Honduras to manage the whale shark population shared by these countries, and one is sorely needed.

The evolution of public perception of sharks from vilified predator to cherished charismatic icon is welcome and overdue. But there's still a tremendous amount we need to learn if we are to promote the recovery of their populations to a point where they can ensure the healthy and abundant oceans that we all benefit from. Thank you for the opportunity to speak on their behalf here today.